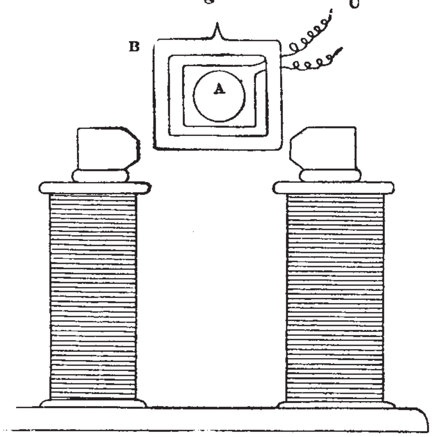
the experiment: you observe that when the mercury is cold, and consequently the pressure in the space between the bulbs very low, a bright discharge passes through the inner bulb, while the space between the bulbs remains quite dark; when we heat the mercury so as to increase the pressure of its vapour, a bright discharge passes through the outer layer, while the inner bulb is quite dark; the outer layer is now a conductor, and by its action screens off from the inner bulb the induction of the coil.

The last experiment I have to show is one on the effect produced by a magnetic field on the discharge. When the discharge has to flow across the lines of magnetic force, the pressure of the magnetic field retards the discharge; when, however, the discharge flows along the lines of magnetic force, the discharge is helped by the magnetic field. This is shown in the following experiment. A is a bulb; B a square tube, one side of which is placed between the poles of an electromagnet; the coil C, which connects the outside coatings of the jars, can be adjusted so that when the magnet is "off," the discharge passes through the bulb but not round the square tube; when, however, the magnet is "on," the discharge passes in the square tube but not in the bulb. In the square tube the discharge passes along the lines of magnetic force and is helped; in the bulb it passes across them and is retarded.

Fig. 6



UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—In a Convocation held on Tuesday, January 29, the degree of Doctor of Medicine, by decree of the House, was conferred on J. S. Burdon Sanderson, F.R.S., Regius Professor of Medicine. Prof. Sanderson was at the same time empowered to discharge the duties of the Waynflete Professor of Physiology, and to dispose of the income of the department during the vacancy in the Waynflete Professorship.

The amendments to the proposed form of statute on degrees for research will be submitted to Congregation on Tuesday, February 12. There are no less than sixty-three amendments, most of which are consequential. The chief amendments propose that the degree of Bachelor of Arts shall be substituted for the proposed degrees of Bachelor of Letters and Bachelor of Science; that the delegacy for the supervision of candidates shall be chosen from among a limited number of University officials, and that there shall be no such delegacy, but that the supervision shall be entrusted to the Boards of Studies.

The Sibthorpian Professor of Rural Economy will deliver an inaugural lecture on Monday, February 4, at 5.30 p.m., on "The Present Relations of Agricultural Art and Natural Science."

Mr. A. B. Trevor Battye will give a lecture before the Ashmolean Society on Monday, February 4, at 8.30 p.m., on his experiences in Kolguev Island.

The Vice-Chancellor has received for the University a bequest from the late Miss Susan Kidd of a portrait of her father, Dr. John Kidd, of Christ Church, formerly Regius Professor of Medicine.

CAMBRIDGE.—The Special Board for Biology and Geology propose that in future the Walsingham Medal, given by the Lord High Steward annually for biological research, shall be open to graduates of the University up to the standing of Master of Arts. Of the three Medals offered, two have been awarded—one for a zoological and the other for a botanical essay. It is also proposed that the Medal shall not be awarded twice to the same person.

The funeral of the late Prof. Cayley will take place on Friday, February 1, in Trinity College Chapel, and the Mill Road Cemetery. Members of the University desiring to be present, are requested to assemble in the College Hall at 1.45 p.m.

The Sedgwick Memorial Syndicate have been empowered to reconsider the plans, or prepare new ones, for the Geological Museum. The estimates for Mr. Jackson's plan exceeded the means at the disposal of the University.

Dr. L. E. Shore, St. John's College, has been appointed an additional member of the Medical Board. Dr. A. Ransome, F.R.S., Dr. J. L. Notter, Dr. T. Stevenson, F.R.S., and Dr. R. Thorne Thorne, C.B., F.R.S., have been appointed Examiners in State Medicine for the current year.

At the Matriculation on January 28, seventeen new students were entered. This brings the total for the present academical year up to 894.

THE Executive Committee of the City and Guilds of London Institute have awarded the first Salters' Company Research Fellowship for the encouragement of higher research in chemistry in its relation to manufactures, to Dr. Martin O. Foster. Dr. M. O. Foster is an old student of the City and Guilds Technical College, Finsbury, and Doctor of Philosophy of the University of Würzburg. For several months he has been engaged in investigating some new derivatives of camphor in the Research Laboratory of the City and Guilds Central Technical College and by the aid of the Salters' Company's Research Fellowship, he proposes to pursue this line of work.

THE Organised Science Schools of the Department of Science and Art are schools in which the instruction is carried on methodically according to one or other of the courses laid down by the Department, or which has been specially submitted to and approved by it. It can easily be understood that such schools represent a very important stage in the system of scientific education which Mr. Acland is doing so much to improve. A number of new regulations, relating to these schools, have just been issued, to come into force after the examinations next May. The most important feature of the new scheme is the introduction of payment on inspection instead of payment on results, for by far the larger part of the instruction given in organised science schools. This modification, which applies to 120 science schools in the United Kingdom, has only become possible since the appointment of a staff of Science and Art inspectors. Another noteworthy feature is that reasonable latitude will be allowed to the teacher as to the nature of the course he may pursue provided the instruction is sound, satisfactory in amount, and combined with proper practical work. Even more satisfactory are the instructions that the practical chemistry for the first year's course should include the setting up of apparatus—weighing and other chemical manipulations, the preparation of gases, the estimation of volume, and so on. Analysis will, in future, occupy a secondary position in introductory courses. The mechanical test-tubing, which has hitherto formed the greater part of practical chemistry in Departmental schools, will thus give place to practical work of real educational value. We also observe that provision is made for a certain amount of literary instruction being given whilst the student is pursuing his science curriculum; that a choice of advanced courses is given; and that an alternative programme suitable for women is formulated, and instruction in subjects specially adapted to them is demanded; that practical instruction must be given in the subjects of science simultaneously with the theoretical instruction. Clearly, the new rules will greatly assist the development and better organisation of scientific education.

SCIENTIFIC SERIALS.

American Journal of Science, January.—Late glacial or Champlain subsidence and reëlevation of the St. Lawrence River basin, by Warren Upham. From the Champlain submergence the Atlantic coast of North America was raised somewhat higher than now; and its latest movement from New Jersey to Greenland has been a moderate depression. As in Scandinavia,

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the restoration of isostatic equilibrium is attended by minor oscillations, the conditions requisite for repose having been overpassed by the early reëlevation of outer portions of each of these great glaciated areas. The close of the Ice Age was not long ago, geologically speaking, for equilibrium of the disturbed areas has not yet been restored.—An automatic mercury vacuum pump, by M. I. Pupin. This pump is a combination of a suction pump capable of raising mercury to practically any height, and an ordinary Sprengel pump, the two being connected by a siphon barometer. Mercury is pumped into the Sprengel reservoir by the suction pump. The reservoir of the latter is provided with two vertical tubes dipping into two mercury vessels. The end of one of these is higher than that of the other, so that when the mercury has fallen to the level of the end, no more mercury enters the tube, and the column already in it is bodily drawn up into the siphon barometer.—Graphical thermodynamics, by René de Saussure. The author recommends the adoption of new coordinates instead of P and V. Instead of these, he advocates the variables ϕ and s, defined by the equations $\phi = \pi/i^2$ and $s = \pi a^2$, where i is the period and a the amplitude of the vibratory motion constituting heat. Then the value of each variable depending upon the phenomenon can be obtained graphically.—Solutions of salts in organic liquids, by C. E. Linebarger. The law enunciated by Schroeder and Le Chatelier, that the solubilities at equal intervals from the temperature of fusion for different solid bodies and in different solvents are the same, although approximately true for the cases investigated by them, is not applicable to the case of inorganic salts in normal organic solvents.

Wiedemann's Annalen der Physik und Chemie, No. 13, 1894.—A new spectrum photometer, by Arthur König. Between the telescope and the collimator, which is provided with two parallel slits, are introduced, besides the refracting flint-glass prism, a twin prism and a Rochon polarising prism. One of the slits is provided with a total-reflection prism, in order to admit the standard light from the side. The field of view shows two semicircles, one for each of the sources of light, and their relative intensities can be adjusted and measured by a Nicoll prism near the eye. The observer notes the angle through which the Nicoll prism must be rotated in order to give equal intensities to the two halves of the field.—Spectra of various sources of light, by Else Köttgen. By means of König's spectrum photometer, various petroleum and gas lamps were spectroscopically studied.—On the process of light emission, by G. Jaumann. The author shows that the emissive vibrations of a luminous body exhibit a damping which may be measured.—Capillary electrometers and drop electrodes, by G. Meyer. The surface tension of mercury and some, but not all, amalgams is reduced by the addition of a solution of a salt of mercury, or of a salt of the metal contained in the amalgam. The reduction of surface tension which takes place during anodic polarisation is due to the formation of such mercuric or metallic salts.—Thermo-electricity of chemically pure metals, by K. Noll. This paper gives an account of a careful redetermination of the thermo-electric forces of pure Cd, Sn, Ag, Au, Cu, Zn, Al, Pt, Mg, Fe, Ni, Hg, and German silver.—Influence of magnetisation and temperature upon the electric conductivity of bismuth, by J. B. Henderson. The author shows that, before bismuth spirals can be employed to measure magnetic fields by their change of resistance, it will be necessary to find a ready means of testing their temperature, as the resistance is profoundly affected by changes in the latter.—High temperature thermometers of Jena glass No. 59^{III}, by Alfons Mahlke. These thermometers have to be filled partly with liquid carbonic acid, after which they may be employed for temperatures up to 550°, the carbonic acid keeping the mercury from boiling. The author describes how he found the expansion of the glass and the mercury for such high temperatures, and calibrated one of the thermometers with reference to the air thermometer.

Bulletin de la Société des Naturalistes de Moscou, 1894, No. 1.—Contributions to the Moss flora of Russia, by Dr. Ernst Zickendrath, being an enumeration of 202 species collected by the author in European Russia proper (in German).—The formation of the primary blastoderms and the origin of the chord and the mesoderm in the Vertebrates, by B. Lwoff (in German, with six plates). A work which already has been partially published in *Biologisches Centralblatt* for 1892; it is based on the study of the embryology of the *Amphioxus*, the *Pteromyzon*, the *Axolotl*, the *Pristiurus* and *Torpedo*, several fishes and the *Lacerta*, and the author comes to the conclusion that the whole of the process is quite different from what is usually described as gastrulation. The paper is to be continued.—A general expression of the Thermodynamic Potential, by N. Oumoff.—Meteorological observations at the Petrovsk Agricultural Academy for the year 1893.

SOCIETIES AND ACADEMIES.

London.

Royal Society, January 17.—"The Latent Heat of Evaporation of Water." By E. H. Griffiths, M.A., Sidney Sussex College, Cambridge.

A calorimeter was suspended within a chamber the walls of which were kept at a constant temperature in the manner described in a previous paper.[1] The calorimeter was filled with a singularly limpid oil, which was stirred by paddles revolving about 320 times per minute, and immersed in the oil was a silver flask, which contained the water to be evaporated. The ends of a platinum-silver coil, within the calorimeter, were maintained at a known constant potential difference, and the rate of evaporation so controlled as to exactly balance the heat supplied by the electric current. The advantages of this method are that the results are not appreciably affected by (1) errors in thermometry; (2) changes in the specific heat of water; (3) errors in the determination of the water equivalent; (4) loss or gain by convection, &c. Differential platinum-thermometers were used, in order to ascertain the equality of the calorimeter temperature and that of the surrounding walls, thus differences of 0·0004° C. could be accurately measured, and smaller differences detected.[2]

A series of experiments in which the saturated vapour was removed from the flask by a stream of dry gas, gave the following results.

Temp. (Nitrogen Scale).	L (in terms of a thermal unit at 15°).
24°·96	581·9
39°·99	572·4
49°·82	566·5

The method of experiment was then altered; rapid evaporation was caused by removal of pressure, and the mass of water evaporated determined in a different manner.

A considerable number of experiments gave the following results.

Temp. (N. Scale).	Extreme values of L.	Mean L.
30°.00	578·58 – 578·90	578·70
40°·15	572·12 – 573·01	572·60

The conditions as to rate of evaporation, &c., were varied greatly during the experiments.

The results are expressed by the following formula:

$$L = 596{\cdot}73 - 0{\cdot}6010\,\theta$$

This formula would give

$$L = 596{\cdot}73 \text{ when } \theta = 0^\circ$$

and

$$L = 536{\cdot}63 \quad ,, \quad \theta = 100^\circ.$$

And these values are almost identical with those obtained by Dieterici at 0° (596·73) and Regnault at 100° (536·60). A study of the results leads the author to the conclusion that the "thermal unit at 15°" must be almost identical with the "mean thermal unit between 0° and 100°." It has been shown by Rowland, by Bartoli and Stracciati, and by the author, that at low temperatures the specific heat of water decreases as the temperature rises, and it is probable that it arrives at a minimum between 30° and 40°, afterwards increasing with rise of temperature. There is, therefore, nothing impossible in the above supposition.

An investigation into the density of aqueous vapour (assuming the author's values of L and J) indicates that at low pressures the density of the saturated vapour is that of a perfect gas, and that at higher pressures (above 140 m.m.) it attains a density about 1·02 times as great as the "theoretical density."

January 24.—"Mathematical Contributions to the Theory of Evolution. II. Skew Variation in Homogeneous Material." By Prof. Karl Pearson, University College, London. (See p. 319).

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[1] "The Mechanical Equivalent," *Phil. Trans.* 1893 A, pp. 361–504.

[2] See *Phil. Mag.* January 1895.

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